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ABSTRACT

The project had two overall goals: (1) to establish and maintain a model marine science facility to be used as a teaching station and a base for research; and (2) to increase student and public awareness about the oceans and the important role they will play in man's future. The project served all the school districts in Kitsap County (Washington) and more than 8,000 students from all grade levels participated. The report discusses the context in which the project was developed, provides a program description and budget statement, and outlines the procedures used in organization and instruction. Also included is a detailed discussion of an evaluation of the program, which indicated that students did significantly gain in their knowledge about the sea and the people who work with it. The report concludes with recommendations for the future, and an appendix which provides a sample of activities and materials used in the marine science instructional program. This work was prepared under an ESEA Title III contract. (JR)

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ED 080345

A MODEL

MARINE SCIENCE LABORATORY

FINAL EVALUATION REPORT UNDER
PUBLIC LAW 89-10, TITLE III

NORTH KITSAP SCHOOL DISTRICT, POULSBO, WASH.

SE 016 496

ED 080345

A Model Marine Science Laboratory

NORTH KITSAP MARINE ENVIRONMENTAL CENTER

Final Evaluation Report

Under Public Law 89-10, Title III

Submitted by

North Kitsap School District No. 400
Poulsbo, Washington

September 15, 1972

Andrew L. Driscoll, Director
C. David Borden
Kjell Schroder

THE NORTH KITSAP MARINE SCIENCE PROJECT 1969-72

SUMMARY

The North Kitsap Marine Science Project had two overall goals: (1) to establish and maintain a model marine science facility to be used as a teaching station and a base for research; and (2) to increase student and public awareness about the oceans and the important role they will play in man's future. The project served all the school districts in Kitsap County and more than 8,000 students from all grade levels participated.

The project is located in Kitsap County on a quiet bay, part of Puget Sound. The county is water oriented with more than 800 miles of marine shoreline. The population of the county lives primarily in a rural setting.

Once the facility was remodeled classes received programs both in the Center and in their classrooms. The project staff developed and tested marine science and environmental education curriculum and audio visual aids throughout the grant period. Inservice training of teachers was carried out in the teachers classrooms.

The performance evaluation on the curriculum was accomplished thru pre- and post tests designed by the staff and the t test for related measures was applied to the data. The test indicated that the students did significantly gain in their knowledge about the sea and the people who work with it.

It has been concluded that it is feasable for school systems to develop a marine science center and develop marine science and environmental education programs.

THE NORTH KITSAP MARINE SCIENCE PROJECT 1969-72

CONTEXT

Locale

The North Kitsap Marine Science Project is located in the Marine Environmental Center in the North Kitsap School District No. 400 which is a rural area consisting of approximately 110 square miles. About 2,500 families live within the district's boundaries. North Kitsap is the upper end of the Kitsap Peninsula, bounded on the west by Hood Canal and on the east by Puget Sound. The Marine Science Project also serves the other four school districts in Kitsap County.

The estimated population of the area served is 90,000, or about 2.7% of the 3,300,000 population of the State of Washington. Kitsap County is a peninsula which consists of 394 square miles. The estimated number of persons per square mile is 228; that of the state is 45. Kitsap County is among twelve of the most rapidly growing counties in the state, showing a percentage increase of 89.6% from 1940 to 1960. Kitsap County lies west of the densely populated Seattle area and is separated from Seattle by the waters of Puget Sound. The majority of Kitsap County residents are employed at one of the three Kitsap County federal installations -- The Bangor Naval Ammunition Depot, the Puget Sound Naval Ship Yard at Bremerton, or the Keyport Naval Torpedo Station. Recently the unemployment rate has increased well above the national average.

Recently the area has been attracting retired people and people working in Seattle commuting by ferry.

The School System

The Marine Science Project is a part of the North Kitsap School District and serves the entire county (see Fig. 1). The North Kitsap School District consists of four elementary schools, a junior high school and a senior high school with an enrollment of 2,900 students. Poulsbo (population of 1,700) is the largest incorporated town within the district. Other small towns are Keyport, Port Gamble, Suquamish and Kingston.

The four participant districts range in size from the Bremerton School District with 9,200 students to Bainbridge Island with 2,200 students. The participating districts (combined enrollment 25,000) operate twenty-five elementary schools, four junior high schools and five senior high schools. Olympic College, a two-year community college located in Bremerton, serves approximately 3,000 students. The largest private school is the Star of the Sea Catholic School in

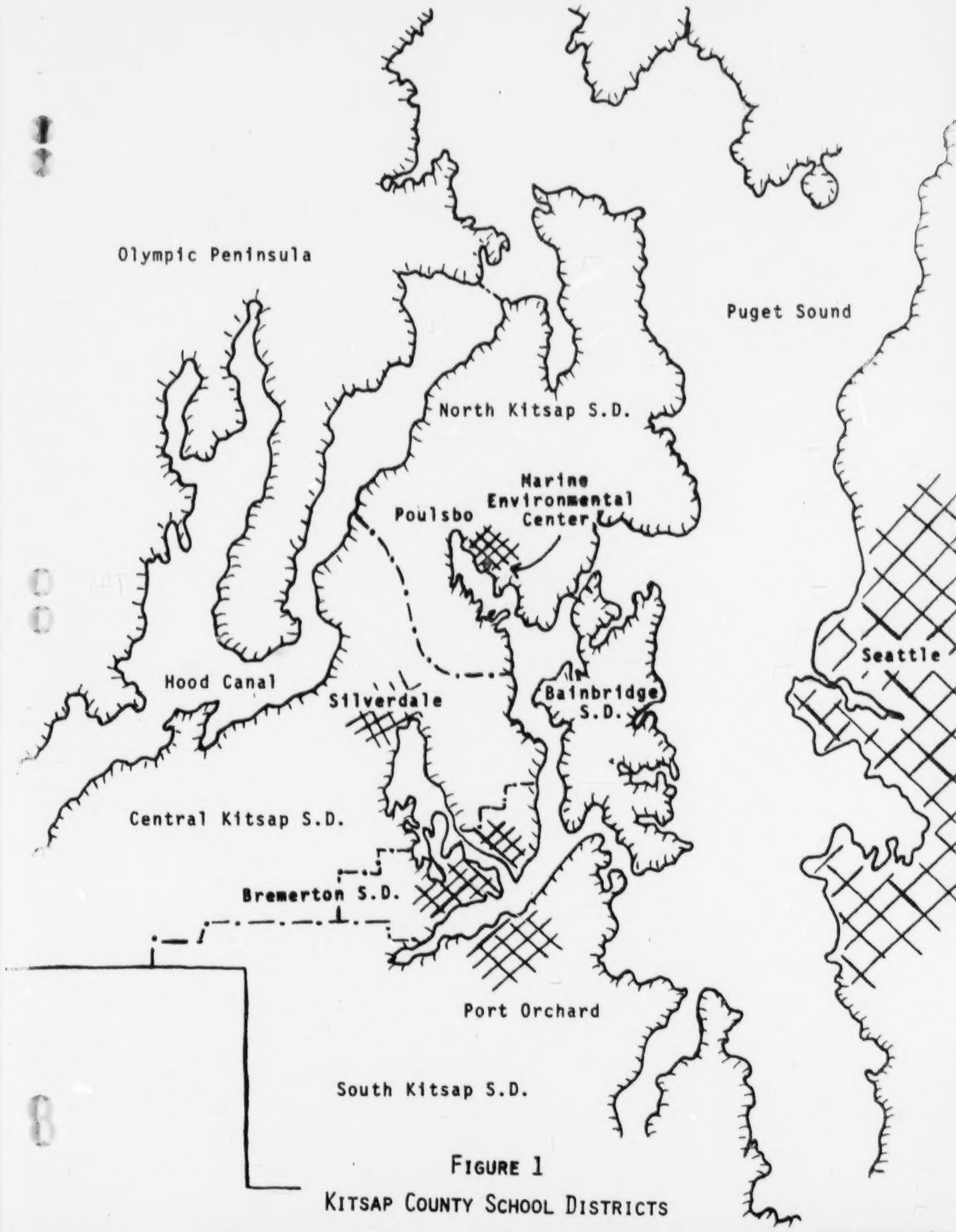


FIGURE 1

KITSAP COUNTY SCHOOL DISTRICTS

Bremerton (enrollment 325 in grades 1-8). Two other private schools have a combined enrollment of 24 students. Bremerton (population 39,000) is the county's largest city. Port Orchard, the County Seat, is next (3,900). Both cities are located in the southern half of the county (Fig. 1). The Bremerton School District is the only urban district in the county. In all the districts but Bremerton, recent population increases have brought about building programs and about half of the school buildings are relatively new in the rural districts. The majority of the Bremerton Schools are old.

Four of the districts have recently been unable to pass special maintenance and operation levies with a resulting 20 to 30 percent of school programs and auxillary services eliminated. The North Kitsap Marine Science Project would have been fully financed for 1972-73 if the special levies had passed.

Special Factors

Needs: The general educational needs of children in this area are no different than the needs which have been given priority by the United States Office of Education and the Office of the State Superintendent of Public Instruction.

Some additional specific educational needs of the Puget Sound area, however, are related to marine science. These needs, expressed by many prominent local, state, federal, and international groups and individuals, were summarized by the Puget Sound Oceanographic Study Committee. This committee outlined oceanographic needs for government, industry, higher education and the public schools. The public school needs were identified as follows:

1. The need to supply adequate numbers of qualified personnel for meeting predicted increases in oceanographic activities.

2. The need to achieve enlightenment of the general public on oceanographic matters.

3. The need for teacher training curricula to be initiated so that broad aspects of oceanography can be introduced into the public schools through science courses such as chemistry, biology, physics, and the new math, etc.

4. The need for marine laboratories geared to below the graduate level of instruction.

5. The current and future need for technician and vocational level employees in the marine sciences.

The needs which the North Kitsap Marine Science Project has focused on are a combination of the educational needs as expressed by the United States Office of Education, the Office of the Superintendent of Public Instruction and many individuals and groups in the oceanographic complex (government, education and industry). The needs this project has attempted to fulfill are:

1. The need for a disseminating agency to promote, support, and encourage the utilization of the potentials of marine science.

2. The need for a model marine science station to be used as a teaching station and a base for research.

3. The need for all citizens to have at least a general knowledge about the sea and the role it will play as man's next frontier.

4. The need for dynamic programs which provide students with meaningful experiences, expand the curriculum beyond the four walls of the classroom, recognize that children progress at different rates, and have different modes of learning.

5. The need for in-service education for teachers.

6. The need to stimulate an interest in and an awareness of the vocational opportunity in academic and non-academic fields of marine science.

7. The need to create an awareness in all citizens for conservation of natural resources.

8. The need for improved programs for handicapped children.

Historical Background: Previous to this program there were no marine science programs in Kitsap County except at Olympic Junior College.

In 1966 the North Kitsap School District began developing plans to include marine science in the school district curriculum. By 1968 a $20,000 planning grant through Title III, E.S.E.A. was received and resulted in a comprehensive three year operational grant application being submitted in 1969. The entire North Kitsap community participated in the development of this application and the other school districts in Kitsap County pledged cooperation in maintenance of the program.

Community support was evidenced by the tremendous generosity of Mr. Joe Engman, Poulsbo's oyster grower, who leased a building site to the North Kitsap School District on a twenty year free lease. The National Association of Naval Technical Supervisors gave assistance throughout development of the project. Many Kitsap County teachers and Olympic College instructors spent time developing an outline for a marine science curriculum.

With full funding in 1969 a staff of two, director and elementary coordinator, was hired full time. An architect from the community volunteered over $5,000 of his services to designing and overseeing remodeling of the 6,000 sq. ft. facility. Remodeling was completed at the close of the first year of operation and summer classes began immediately.

The position of county coordinator was added in the fall of 1970. The officieal dedication of the facility was on November 1, 1970 when U. S. Senator Warren Magnuson addressed a standing room only crowd of 500, including dignitaries from Oregon and Alaska as well as Washington. During the two years the facility has been operational more than 8,000 Kitsap County students spent more than 43,500 student hours in programs at the Center. Non Kitsap County groups accounted for over 12,500 student hours, and over 3,500 visitors signed in.

E.S.E.A. Title III support ended in June 1972.

PROGRAM DESCRIPTION

Scope

The overall goal of the North Kitsap Marine Science Project is to serve as a catalytic agent:

--to promote and support more effective utilization of Puget Sound's natural marine resources by enriching and enhancing currently existing kindergarten through grade 12 science programs.

--to develop and supply instructional materials and programs which use the potential of marine science as a central integrating theme through which many aspects of science can be taught more effectively and meaningfully.

--to stimulate public interest in and awareness of the broad field of marine science, recognizing the role the ocean is destined to play in the future of Kitsap County, specifically, and Puget Sound in general.

Students served by the program ranged from kindergarten through 12th grade. Approximately 5000 Kitsap County students are served annually. Also, adult courses and teacher workshops have been conducted.

To reach the goals of the program the following revised objectives were staced for the final year of the project, 1971-1972:

A. INSTITUTIONAL

A-1. The staff at the North Kitsap Marine Environmental Center will develop and test the appropriateness of second and sixth grade marine science resource units for distribution to second and sixth grade teachers in Kitsap County in June 1972.

A-2. The staff at the North Kitsap Marine Environmental Center will develop and test the appropriateness of four high school individualized learning activity units in marine science for distribution to high school teachers in Kitsap County in June 1972.

A-3. The staff at the North Kitsap Marine Environmental Center will prepare a written directory of all identified community resource people available for planning, implementation and evaluation of marine

science, outdoor and environmental education activities. The directory will be available in June 1972.

A-4. The staff at the North Kitsap Marine Environmental Center will complete a plan by December 1971 for continued financial support of the North Kitsap Marine Science Project beyond June 1972.

A-5. The staff at the North Kitsap Marine Environmental Center will maintain and improve the facility's aquariums, live animal trays, library, dark room and laboratory equipment for maximum use during the 1971-72 year.

A-6. The staff at the North Kitsap Marine Environmental Center will maintain and improve services for North Kitsap Junior High and Senior High science programs, adult education, other secondary science programs in Kitsap County, Olympic College classes, and non-school groups.

B. INSTRUCTIONAL

B-1. During the 1971-72 school year, students in the North Kitsap schools in grades two and six, using the marine science elementary units which have been developed and tested at the North Kitsap Marine Environmental Center, will show significant growth in knowledge and skills which are presented in the marine science elementary units.

B-2. During the 1971-72 school year, 50 to 60 North Kitsap high school students will show significant growth in their knowledge of marine science skills and content using units developed and tested at the North Kitsap Marine Environmental Center.

B-3. During the 1971-72 school year, sixth grade students in Kitsap County will show significant growth in their knowledge of marine science by using North Kitsap Marine Science Project units and visiting the Marine Environmental Center for at least one lab activity.

Personnel

The full time staff of the project consisted of a director, elementary coordinator, county coordinator and secretary-bookkeeper.

Director:

Qualifications - successful administrative and teaching experience; a Master's degree; experience with fiscal administration and curriculum development; ability to write and speak effectively; and experience with personnel management.

Responsibilities - be responsible for over-all administration, supervision, and coordination of the project; maintain communications with all cooperating agencies; be responsible for accurate and punctual submission of all required reports; maintain appropriate records; be responsible for personnel, materials, equipment and services. In addition, the director will assist in teaching the high school class and in the development of the high school curriculum.

Elementary Coordinator:

Qualifications - successful elementary teaching experience with a major interest and background in curriculum development and interest and background in marine science.

Responsibilities - responsible for directing and coordinating elementary functions in the North Kitsap School District; developing elementary curriculum; developing instructional materials; aiding in maintenance of facility; assisting in teaching the high school class; directing elementary in-service activities; and performing other duties assigned by the director.

County Coordinator:

Qualifications - same as the elementary coordinator.

Responsibilities - responsible for directing and coordinating elementary and secondary functions in the participating school districts in Kitsap County. Other responsibilities are similar to those of the elementary coordinator.

Secondary Coordinator:

During the second year of operation a secondary teacher was hired for teaching and curriculum development. This position was eliminated after one year. The director took over the responsibilities of this position for the final year.

Qualifications - successful secondary teaching experience with a major in science; background and interest in marine science; and curriculum development experience.

Responsibilities - responsible for coordinating secondary functions; assisting in development of instructional materials; assisting with in-service activities; assisting with curriculum development.

During the last year of operation an evaluation specialist was hired part time to aid in gathering data on student change. The evaluator, also, provided in-service training for the staff in the areas of performance objectives and goal setting.

PROCEDURES

Organizational Details

The North Kitsap Marine Science Project has been funded by E.S.E.A. Title III for four years (one planning and three operational) and this report is the final report for the three year operational grant.

Physical Arrangements: During the first operational year the project was located at the central administrative office while the marine science facility was planned and remodeled with Title III funds. During the second and third years the project was based in the marine science facility.

The North Kitsap Marine Environmental Center is located over the water of Liberty Bay about one mile from the high school, junior high and one elementary school. The facility contains about 6,000 sq. ft. (Fig. 2) divided into two main areas: one is for teaching and working with students and includes a resource room with library and audio visual areas, and a laboratory with student work space and sea water tanks for keeping living marine animals; the other area is mainly for administration, curriculum development and special projects and includes a complete dark room, graphic arts area, offices, science research room and storage. Docking facilities are available and small boats are moored there for use throughout the year.

Review and Planning: During the course of the project the staff met weekly to discuss progress and make necessary changes. Daily conferences took place as activities were being developed and tested. Since the staff was full time it was possible to maintain continuous communication regarding program needs and developments.

Besides project staff other North Kitsap school administrators including the federal projects coordinator and the curriculum director were involved in program decisions. In designing programs for the participating districts, teachers and administrators from each district were consulted during all phases.

In-service training was provided for the staff by the project evaluator in the areas of performance objectives and goal setting using sound film strips and reference books. The project staff provided in-service training in marine science for the elementary teachers in the program. The staff meet with teachers during the school day for classroom training and after school for individualized training.

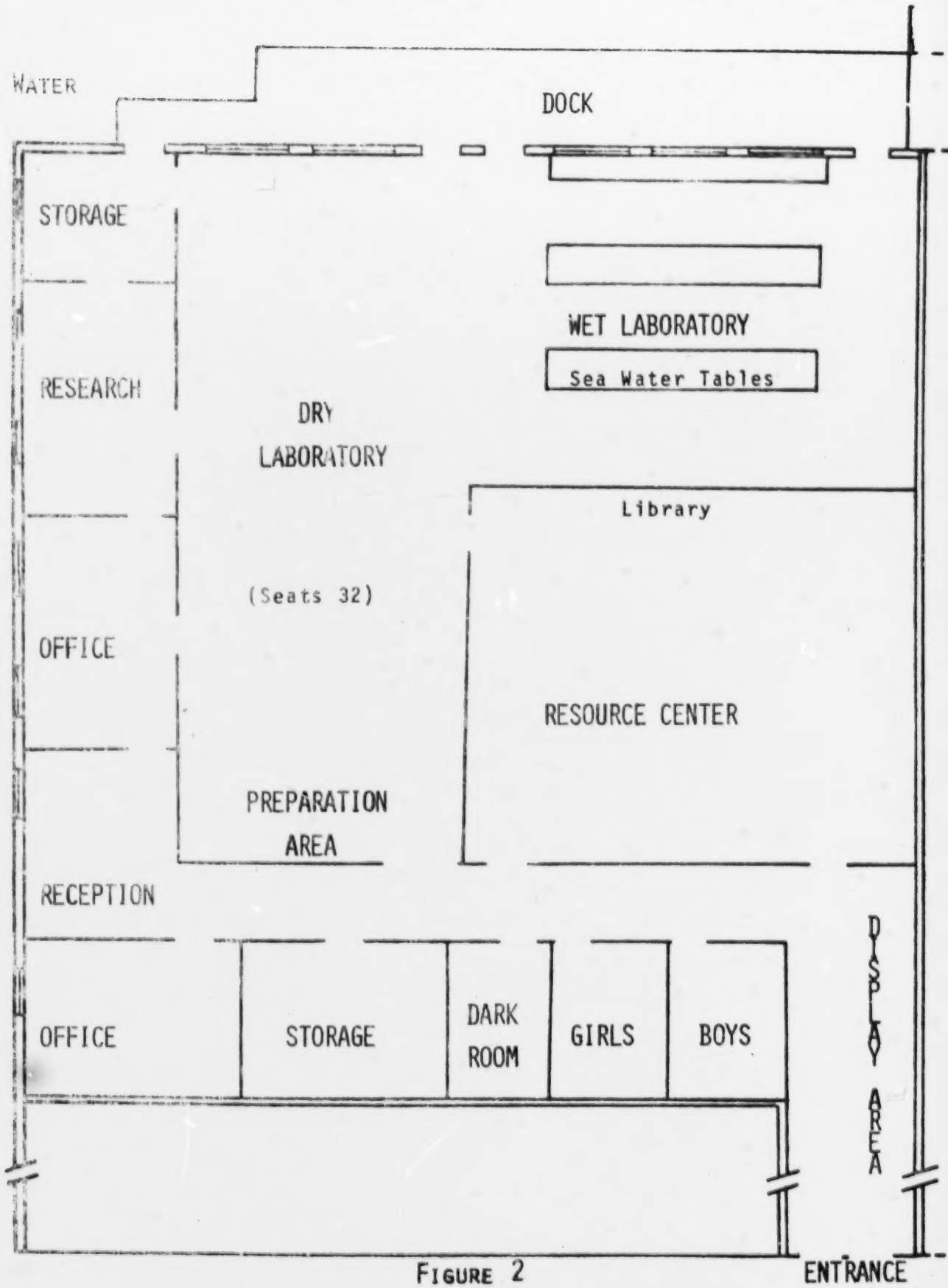


FIGURE 2

NORTH KITSAP MARINE ENVIRONMENTAL CENTER FLOOR PLAN

6000 SQUARE FEET

Activities and Services

The project contained both activities and services.

Staff Activities Included:

1. The development of curriculum units in marine science at the second, fourth, sixth grades and high school levels.
2. The building of audio-visual equipment such as salt water classroom aquariums, a multi-media study carrel with demonstration instructional programs.
3. The development of a marine science reference library including film loops and 16 mm films.
4. The development and maintenance of a continuous flow sea water system for maintaining live marine animals for student study, classroom demonstration and public viewing.
5. The gathering of marine specimens from Puget Sound waters by various means including SCUBA, beach seine, otter trawl and hand collecting.

Services included:

1. Scheduling classes for activities at the Center.
2. Providing classroom aquariums and marine specimens.
3. Providing in-service teacher training for teaching the marine science units in the classroom.
4. Providing all necessary worksheets, materials and equipment for teachers to use the curriculum units.
5. Providing staff time in conducting activities with classes at the Center while giving teachers on the job experience.

Student Activities Included:

1. Orientation for all activities at the Center.
2. Working with live marine animals, oceanographic equipment and microscopes.
3. Boating safety, shipboard oceanographic sampling.
4. Organized beach field trips.
5. Individualized student projects.

6. Research projects for talented students.

7. Salmon aquaculture studies.

8. Special audio-visual activities.

9. Classroom projects.

10. Commercial fishing techniques.

11. Audio-visual aids development.

A review of the project objectives will reveal that the proceeding lists relate to most of the objectives.

A typical week's schedule showing student programs and staff activities follows in Fig. 3.

The elementary students using the Center received classroom work before coming to the Center and the project staff would adapt lab and field activities to the needs of each given class. Classes meeting only once in the lab, with little or no pre-training, were handled with flexibility once the project staff worked with the class in an orientation. Thus, most classes and sometimes individual students received programs adapted to their level of understanding about the marine environment. The curriculum units were designed with some flexibility but it was found that in practice more flexibility was necessary. Final units reflect more flexibility.

An important part of each activity was the worksheet which the student could take home and keep. Parents learned the most about our programs through the information and worksheets brought home.

FIGURE 3

LAB UTILIZATION - MAY 3 - 8, 1971

(Actual Schedule)

MONDAY

8:00 – 9:00	Staff
9:30 – 10:30	C.K. - 7th*
10:30 – 11:30	N.K. - 8th
1:00 – 1:20	N.K. - HS
1:20 – 2:30	B.I. - HS*
2:30 – 3:30	B.I. - HS*

TUESDAY

9:00 – 11:00	N.K. - 5th
11:00 – 1:00	Brem. - 6th* (60 students)
1:00 – 2:30	N.K. - HS
3:00 – 5:00	N.K. C.K. B.I.* HS Gifted

WEDNESDAY

8:00 – 9:00	Staff
9:30 – 10:30	C.K. - 7th*
10:30 – 11:30	N.K. - 8th
1:00 – 2:30	N.K. - HS
4:00 – 4:30	Silverdale* Cub Scouts

THURSDAY

9:30 – 11:00	C.K. - 6th*
11:30 – 1:00	S.K. - 5th*
1:00 – 2:30	N.K. - HS
3:00 – 5:00	N.K. C.K. B.I.* HS Gifted

FRIDAY

8:00 – 9:00	Staff
9:00 – 10:30	N.K. - 3rd
11:00 – 12:30	S.K. - 5th*
1:00 – 2:30	N.K. - HS

SATURDAY

10:00 a.m. – 4:00 p.m.	Gifted Program* for Neah Bay, Quillayute, Crescent Bay, Students

NOTES:

Average class size = 30 students

* Indicates classes from other school districts

Instructional Equipment and Materials

Two of the project objectives were devoted to curriculum development. At the elementary level units were developed for the second and sixth grades.

The sixth grade unit was completed and reproduced. It has for its goal environmental awareness for teachers and students. The unit is an attempt to incorporate specific instructional and performance objectives to teach essential marine science concepts. The unit is designed to be taught both in the classroom and at the Marine Environmental Center. The unit is color coded for ease of use by the teacher and has incorporated a multi-media approach utilizing transparencies, films, film strips, models, study cards, laboratory equipment, oceanographic equipment and living marine animals. The unit is designed to cover a four to six week period, however, due to the built in opportunities for individualization it could be extended for a longer period. The appendix contains one of the activities in the unit.

The second grade unit is still in the preliminary draft stages. The goal of the unit is to provide teachers and students experiences in discovering their surrounding marine environment.

The unit is uniquely designed to allow for individual teaching differences. The teacher may select from the Program Chart the type of instructional package he or she feels would be appropriate for their particular students. Even though two different teachers may select two different approaches via the Program Chart the students of both teachers will be taught the same basic concepts and behavioral outcomes will be very similar.

The unit also incorporates a variety of laboratory experiences using live animals at the Marine Environmental Center. In addition the teacher is given opportunities for inservice assistance with the unit and the many resources available through the Marine Environmental Center.

An example section of the second grade unit follows in the appendix.

Tied in with the elementary curriculum development was the design and construction of a model multi-media study carrel for individualized instruction.

Model Description: The illustrative model of individualized activities was designed to communicate some activity possibilities and to act as a guide or reference in developing individualized instruction segments. The overall design of the model was based on a study carrel concept of individualized instruction. The materials and activities were developed in conjunction with the

district's elementary marine science curriculum objectives and are appropriate for the sixth grade level.

The model uses a multi-media approach to instruction and includes the use of slides, filmstrip, filmloop, tape recording, aquaria, and books to facilitate the communication process. The activity segment utilizing the filmloop was designed to give the student an opportunity to explore the subject content area of the broad field of marine science and to stimulate further interest and appreciation for marine life by increasing his awareness of a marine environment. An 8 mm movie camera was utilized in the development of this segment, and the subject matter was filmed on local beaches. The movie film was edited and spliced and then placed into a film loop cartridge by project staff and with project equipment.

The listening activity segment was designed to give the student a new awareness of the marine environment. An attempt to isolate individual marine sounds made this segment one of the most difficult to develop.

The filmstrip activity segment began as a programmed instruction segment which was later adapted to filmstrip form. The program was developed and printed on 3" by 5" cards. After being successfully field tested it was reproduced in slide form with the use of the 35 mm single-lens-reflex camera and close-up attachment. Slides of appropriate pictures and slides of appropriate aquarium life were added, and the entire sequence was again reproduced, this time with the 35 mm single-lens-reflex half-frame camera and slide copier. The film was the processed without the usual cutting and mounting, leaving the film in filmstrip form.

The instructional sequencing segment consisting of the carousel slides was developed similarly to the filmstrip. The programmed sequence was first developed and typed on 3" by 5" cards. It was then reproduced into slide form.

The self contained salt water aquarium has added a great deal to student motivation as well as provide for a source of unlimited activities. The salt water aquarium was built by project staff and the entire multi-media carrel was built in the school districts maintenance shop.

There are many commercially prepared audio-visual materials available to the teacher, but some how the process of developing one's own materials and becoming personally involved adds a great deal to the effectiveness of their use in the classroom. In the same manner, student involvement adds to that which the student is to receive.

Following is a list of the audio-visual equipment and materials acquired by the project for curriculum production and instructional use:

Equipment	Materials
cassette tape recorder	cassette tapes
filmstrip projector	books
filmloop projector	periodicals
16 mm projector	*16 mm movies
super 8 mm projector	*8 mm film loops
slide projector	*transparencies
35 mm camera	*models
super 8 mm camera	charts
35 mm half frame camera	slides
classroom marine aquariums	
microscopes	

*These materials were the most helpful during classroom activities.

BUDGET

The total cost of the Marine Science Project (Sept. 1969 - June 1972) was about $345,000.00. Funds were provided from the following sources:

1969-70

Title III E.S.E.A. (inc. remodeling)	$131,765.00
North Kitsap School District	13,000.00
Title II E.S.E.A. (films)	900.00
	$145,665.00

1970-71

Title III E.S.E.A.	$ 89,800.00
North Kitsap School District	15,000.00
	$104,800.00

1971-72

Title III E.S.E.A.	$ 78,000.00
North Kitsap School District	13,625.00
Central Kitsap School District	875.00
Bainbridge Island School District	500.00
	$ 93,000.00

"Start-up" costs were incurred throughout the three years as programs were developed. These costs included building remodeling costs of $110,800.00 to provide a complete marine science facility and $112,250.00 for curriculum and program development, including office and instructional equipment, supplies and materials and evaluation consultants. As projected in the original application, the continuing program cost is about $60,000.00. This amount included three professional salaries, one secretary, facility overhead, upkeep of instructional equipment and materials and supplies.

The major catagories of expenditures were used throughout the program, except for remodeling, and included the following: (The amounts are approximate for the entire three year period.)

Salaries and benefits:

Certified and administrative	$122,500.00
Secretarial	20,300.00
Non-certified (custodian, maintenance ..)	19,430.00
	$162,230.00

Administration:

Evaluation, consultants . .	9,000.00
Supplies and postage	3,000.00
Equipment (typewriters, mimeo, photocopy..)	5,000.00
	$17,000.00

Travel (all staff):	$3,500.00
Instruction:	
Supplies and materials	$ 6,000.00
Curriculum development, boat rental	7,000.00
Equipment (oceanographic instruments, microscopes, etc.)	19,000.00
	$32,000.00
Library books, subscriptions & supplies:	$3,000.00
Audio-Visual:	
Supplies and services	$2,500.00
Equipment	3,000.00
	$5,500.00
Overhead:	
Custodial & maintenance supplies	$1,500.00
Boat insurance	500.00
Utilities & phone	6,000.00
Contracted maintenance services	1,500.00
	$9,500.00
Remodeling:	$110,735.00

With a full staff of three teachers, the average per pupil cost of the continuing program is between $15.00 and $20.00 per year. This figure is based on an approximate operational budget of $60,000.00 per year and a student attendance level at about 4,000 per year.

More detailed budget information can be obtained by writing to the Director of the Marine Environmental Center, North Kitsap School District 400, Route 1, Box 631, Poulsbo, Washington 98370.

EVALUATION

The overall goal of the North Kitsap Marine Science Project was to serve as a catalytic agent:

--to promote and support more effective utilization of Puget Sound's natural marine resources by enriching and enhancing currently existing Kindergarten through Grade 12 science programs.

--to develop and supply instructional materials and programs which use the potential of marine science as a central integrating theme through which many aspects of science can be taught more effectively and meaningfully.

--to stimulate public interest in and awareness of the broad field of marine science, recognizing the role the ocean is destined to play in the future of Kitsap County, specifically, and Puget Sound in general.

In attempting to reach the project goal several objectives were determined. For evaluation purposes, only the following objectives will be discussed.

Performance Objectives

B-1 During the 1971-72 school year students in the North Kitsap schools in grades two, four and six, using the marine science elementary units which have been developed and tested at the North Kitsap Marine Environmental Center, will show significant growth in knowledge and skills which are presented in the marine science elementary units.

B-3 During the 1971-72 school year sixth grade students in Kitsap County will show significant growth in their knowledge of marine science by using North Kitsap Marine Environmental Center units and visiting the Center for at least one lab activity.

Program Objectives

A-1 The staff at the North Kitsap Marine Environmental Center will develop and test the appropriateness of second grade and sixth grade marine science resource units for distribution to second and sixth grade teachers in Kitsap County by June 1972.

A-3 The staff at the North Kitsap Marine Environmental Center will prepare a written directory of all identified

community resource people available for planning, implementation and evaluation of marine science, outdoor and environmental education activities. The directory will be available by June 1972.

A-4 The staff at the North Kitsap Marine Environmental Center will complete a plan by December 1971 for the continued financial support of the North Kitsap Marine Environmental Center project beyond June 1972.

A-5 The staff at the North Kitsap Marine Environmental Center will maintain and improve the facility's aquariums, live animal trays, library, dark room and laboratory equipment for maximum use during the 1971-72 school year.

A-7 The staff at the North Kitsap Marine Environmental Center will maintain and improve services for North Kitsap Junior High and Senior High science programs, adult education, other secondary science programs in Kitsap County, Olympic College classes and non-school groups.

Performance Evaluation

Choosing Participants: Participants in the project programs ranged from kindergarten to grade 12. Those chosen for evaluation were sixth grade students from Kitsap County schools. All of the students that volunteered for the program did complete the program and evaluation.

Describing Participants: Of the 190 participants in the program, 113 were boys and 77 were girls. Metropolitan Achievement Test scores were available, however, students were evaluated by means of pre and post tests designed specifically for the program.

Measuring Changes: A pre-post measure was used in order to determine whether or not the program objective was achieved. Two forms of test instruments were developed to test adequacy of items and determine whether some components showed different rate growth than others. Pre and post test instruments were developed by staff members and tested for validity before being used. Both pre and post tests were determined to be suitable for the sample to which they were administered. Each instrument contained enough easy items to discriminate among the weaker students and a sufficient number of difficult items to discriminate among the abler children.

Raw score differences were determined between pre and post measures. Mean score differences were determined and used in the statistical formula: the t Test for Related Measures. To determine whether the t value was significant, the degrees

of freedom were obtained. Comparing derived scores with t table figures showed level of significance. Tables 1 and 2 show raw scores on pre and post measures, forms A and B. Concluding statements regarding measured outcomes of test scores follow each derived t score.

TABLE 1

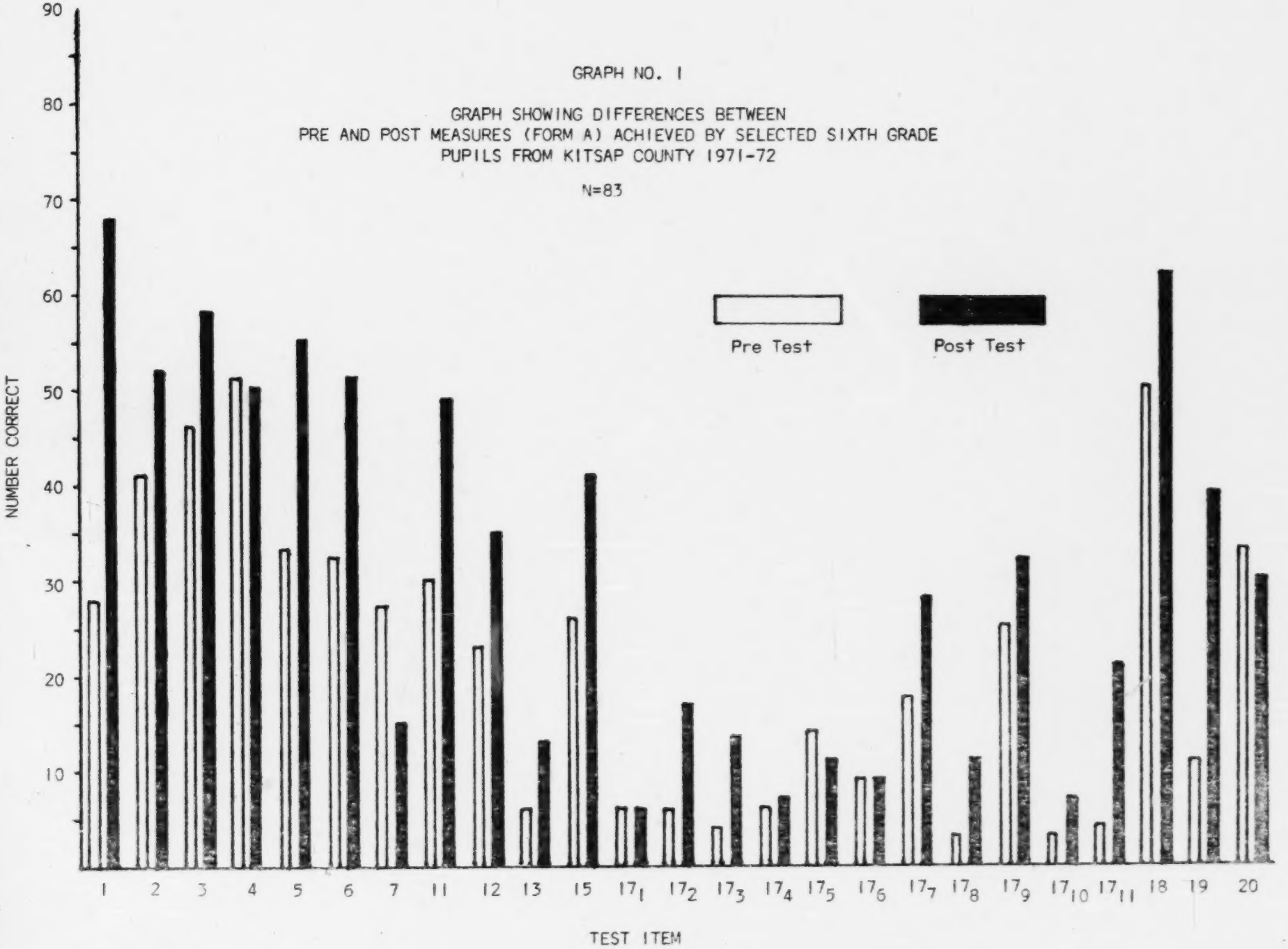
TEST FOR SIGNIFICANCE
1971-72
PRE-POST MEASURES ON STAFF DEVELOPED
TEST (FORM A) NKMEC-KITSAP COUNTY GRADE 6

Item	Pre-Test Correct	Post Test Correct	D	D^2
1	28	68	40	1600
2	41	52	11	121
3	46	58	12	144
4	51	50	-1	1
5	33	55	22	484
6	32	51	19	361
7	27	15	-12	144
11	32	49	17	289
12	23	35	12	144
13	6	13	7	49
15	26	41	15	225
17_1	6	6	0	0
17_2	6	17	11	121
17_3	4	13	9	81
17_4	6	7	1	1
17_5	14	11	-3	9
17_6	9	9	0	0
17_7	17	28	11	121
17_8	3	11	8	64
17_9	25	32	7	49
17_{10}	3	7	4	16
17_{11}	4	21	17	289
18	50	62	12	144
19	11	39	28	784
20	33	30	-3	9
	515	780	244	5201

GRAPH NO. 1

GRAPH SHOWING DIFFERENCES BETWEEN
PRE AND POST MEASURES (FORM A) ACHIEVED BY SELECTED SIXTH GRADE
PUPILS FROM KITSAP COUNTY 1971-72

N=83



t TEST FOR RELATED MEASURES

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{\Sigma D^2 - \frac{(\Sigma D)^2}{N}}{N(N-1)}}}$$

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{5201 - \frac{(244)^2}{25}}{N(N-1)}}}$$

$$t = \frac{31.2 - 20.6}{\sqrt{\frac{5201 - 23.81}{N(N-1)}}}$$

$$t = \frac{10.6}{\sqrt{\frac{5177.19}{600}}}$$

$$t = \frac{10.6}{\sqrt{8.63}}$$

$$t = \frac{10.6}{2.9}$$

$$t = 3.65$$

For the t Test For Related Measures, the df = N-1 where N is the number of pairs of scores. The t value that is significant at the .05 level for 24 df is 2.064. Since the obtained t is larger than 2.064 it is concluded that the training program significantly improved student performance.

TABLE 2

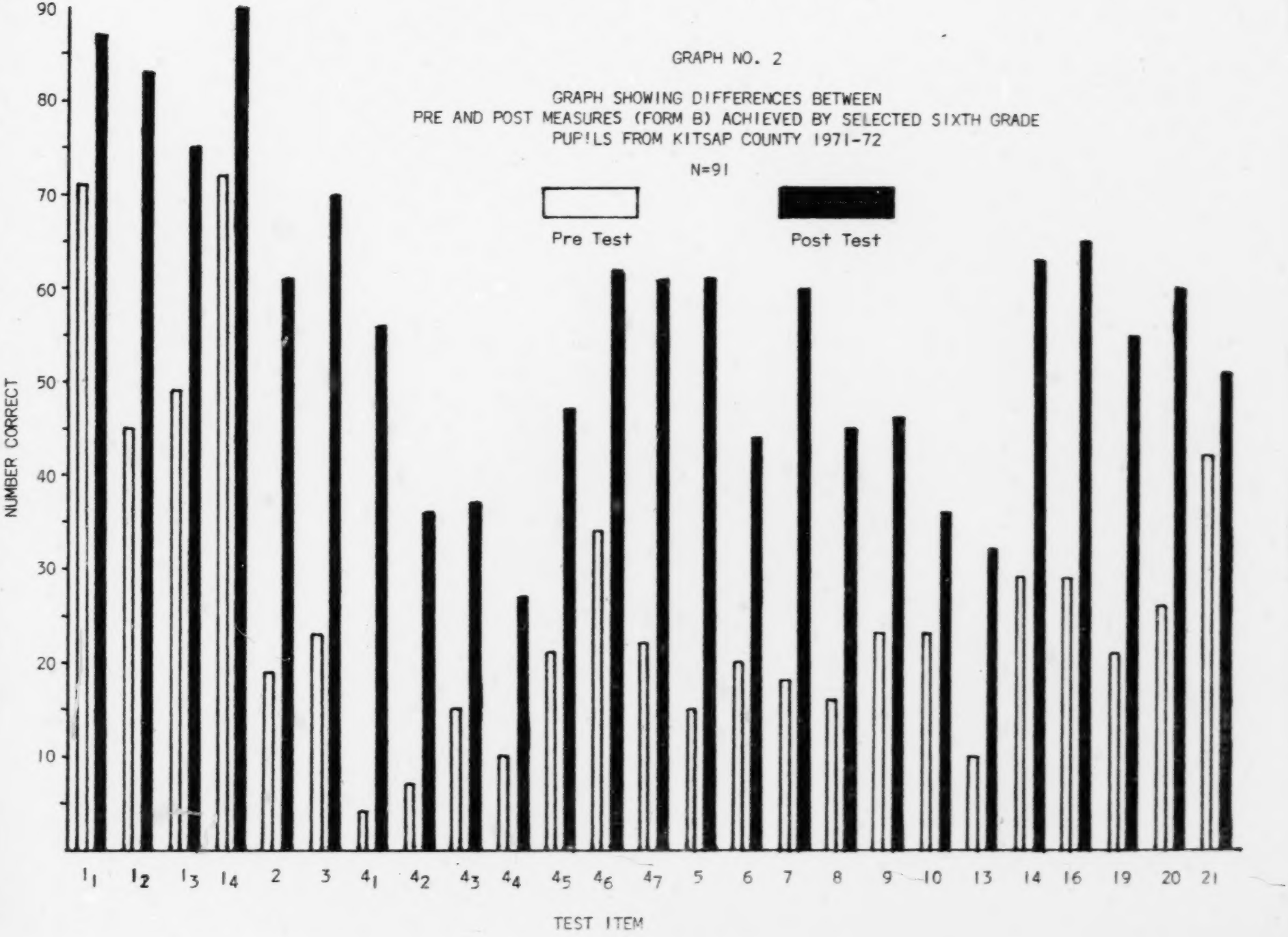
TEST FOR SIGNIFICANCE
1971-72
PRE-POST MEASURES ON STAFF DEVELOPED
TEST (FORM B) NKMEC-KITSAP COUNTY GRADE 6

Item	Pre-Test Correct	Post Test Correct	D	D^2
1_1	71	87	16	256
1_2	45	83	38	1444
1_3	49	75	26	676
1_4	72	90	18	324
2	19	61	42	1764
3	23	70	47	2209
4_1	4	56	52	2704
4_2	7	36	29	841
4_3	15	37	22	484
4_4	10	27	17	289
4_5	21	47	26	676
4_6	34	62	28	784
4_7	22	61	39	1521
5	15	61	46	2116
6	20	44	24	576
7	18	60	42	1764
8	16	45	29	841
9	23	46	23	529
10	23	36	13	169
13	10	32	22	484
14	29	63	34	1156
16	24	65	36	1296
19	21	55	34	1156
20	26	60	34	1156
21	42	51	9	81
	653	1400	743	25290

GRAPH NO. 2

GRAPH SHOWING DIFFERENCES BETWEEN
PRE AND POST MEASURES (FORM B) ACHIEVED BY SELECTED SIXTH GRADE
PUPILS FROM KITSAP COUNTY 1971-72

N=91



t TEST FOR RELATED MEASURES

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{\Sigma D^2 - (\Sigma D)^2}{N(N-1)}}}$$

$$t = \frac{26.12 - (56.00)}{\sqrt{\frac{25,290 - \frac{552,049}{25}}{25(24)}}}$$

$$t = \frac{29.88}{\sqrt{\frac{25,290 - 22,082}{600}}}$$

$$t = \frac{29.88}{\sqrt{\frac{3208}{600}}}$$

$$t = \frac{29.88}{\sqrt{5.34}}$$

$$t = \frac{29.88}{2.31}$$

$$t = 12.93$$

For the t Test For Related Measures, the $df = N-1$ where N is the number of pairs of scores. The t value that is significant at the .05 level for 24 df is 2.064. Since the obtained t is larger than the 2.064, it is concluded that the training program improved student performance.

Program Evaluation:

The project staff and other elementary teachers developed and tested the appropriateness of second and sixth grade marine science resource units for distribution. Samples from the units are included in the appendix.

The project staff completed a Resource Directory which includes a list of available resource people in the fields of marine science and environmental education. The Directory also includes listings of books, audio-visual materials and laboratory equipment available for use at the Marine Environmental Center. A sample of the Directory is in the appendix.

The project staff has continually improved the facility by increasing the numbers and kinds of aquarium facilities, the capacity of the sea water system, and the number of portable aquariums to ten. The darkroom became fully functional and the library was increased to 256 books and 40 periodicals. Laboratory equipment has continually been used more and more each year. The last years total of laboratory sessions increased by 123.

The project staff developed a plan for continuation funding through cooperation of three school districts. Unfortunately the funds were dependent on special property tax levies and only one district passed its levy. Alternate funding plans are being developed and for the time being continuation funding will be greatly reduced.

The project staff continued to improve services and programs. Tables which follow show laboratory utilization for the 1970-71 and 1971-72 school years. Since the facility was not completed for the 1969-70 school year no laboratory utilization data is included, however several hundred students and many teachers received programs and services in their classrooms. The number of classrooms serviced with portable aquariums reached a maximum of 100 during the final project year.

An actual schedule of one week's laboratory utilization is shown above in Fig. 3 and the detailed breakdown of laboratory useage is shown in Table 3.

Table 3

LAB UTILIZATION

Number of Students - Kitsap County

Group	1970-71	1971-72	Total
Elementary	3477	2768	6245
Junior High	521	765	1286
Senior High	329	204	533
TOTAL	4327	3737	8064

Number of Students - Summer School & Non Kitsap County

Group	1970-71	1971-72	Total
Summer Students	120	44	164
Non-Kitsap	53	358	411
Olympic College	74	106	180
TOTAL	247	508	755

Total students served at North Kitsap Marine Environmental Center (1970-72) = 8819

Data from July 1, 1970 to June 30, 1972

Table 3 (cont.)

Number of Lab Sessions - Kitsap County

Group	1970-71	1971-72	Total
Elementary	100	152	252
Junior High	171	116	287
Senior High	282	408	690
TOTAL	553	676	1229

Number of Lab Hours - Kitsap County

Group	1970-71	1971-72	Total
Elementary	200	293	493
Junior High	184	120	304
Senior High	342	588	930
TOTAL	726	1001	1727

Data from July 1, 1970 to June 30, 1972

Table 3 (cont.)

Number of Student Hours - Kitsap County

Group	1970-71	1971-72	Total
Elementary	6,954	8,175	15,129
Junior High	6,190	3,430	9,620
Senior High	7,885	11,237	19,122
TOTAL	21,029	22,842	43,871

Student Hours - Summer Students & Non-Kitsap

Group	1970-71	1971-72	Total
Summer Students	4,080	2,460	6,540
Non-Kitsap	106	716	822
Olympic College	2,220	3,180	5,400
TOTAL	6,406	6,356	12,762

Number of Students & Student Hours
On Marine Science Leased Boat

Group	Number Students	Student Hours
Elementary	393	165
Junior High	274	68
Senior High	94	110
Senior High H_2O Quality Group	3	75
TOTAL	761	418

Note: The boat was also used by North Kitsap Marine Environmental Center staff in excess of 75 hours to collect marine animals and scientific data.

Student hours = (number of students x number days at lab) x time spent at lab.

Data from July 1, 1970 to June 30, 1972

Table 3

Summary

Number Kitsap Students Served	8,064
Number Non-Kitsap and Olympic College	755
Number Total Students	8,819
Number Lab Sessions Kitsap Students	1,229
Number Lab Hours Kitsap Students	1,727
Number Student Hours Kitsap Students	43,871 + 11,940
Number Student Hours Non-Kitsap Students	~~12,762~~ 822
Number Total Student Hours	56,633
Number Students on Marine Science Boat	761
Number Student Hours Spent on Marine Science Boat	418

During the 1971-72 school year the staff at North Kitsap Marine Environmental Center attempted to improve the program and services offered students and teachers. The data indicates that 590 fewer students were served, however, 123 laboratory sessions and 1813 student hours were added to allow a greater amount of time per student at the Center.

The program was also improved by the staff of the North Kitsap Marine Environmental Center in providing teachers more in-service time, materials and working directly in the classroom and outdoor education programs with students.

RECOMMENDATIONS

On the basis of the success of the Marine Science Project the following recommendations are made by the project staff:

1. The project has proven that it is feasible to develop a marine science project and that other school districts, or groups of districts, can expect to succeed when developing similar centers.

2. There are many potential uses for a center such as the Marine Environmental Center and all uses should continually be re-examined to meet the changing needs of the students and community.

3. Programs oriented toward vocational education should be developed at several grade levels.

4. When districts develop similar programs with outside funds continuation funding commitments should be obtained as early in the project period as possible, expecially where large specialized facilities are involved.

5. Year round operation should be a goal of the project.

6. The marine science programs should be expanded when the school districts in Kitsap County are in a better financial position.

APPENDIX

OCEANOGRAPHY UNIT NO. 6
THE MARINE ENVIRONMENT

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

THE MARINE ENVIRONMENT

TABLE OF CONTENTS

COLOR KEY

UNIT GOALS AND INSTRUCTIONAL OBJECTIVES

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- Films
- Film strips
- Glossary of Marine Terms
- Marine Science Bibliography

INTRODUCTION TO MARINE ENVIRONMENTS

- Objectives and Procedures
- Teacher Presentation
- Film: ENVIRONMENTAL AWARENESS
- Student Work Sheets

SALT WATER ENVIRONMENT

- Objectives and Procedures
- Teacher Background
- Teacher Presentation
- Transparency: CHARACTERISTICS OF SEA WATER
- Student Work Sheet

SEA WATER INVESTIGATION LAB [AT N.K.M.E.C.]

- Objectives and Procedures
- Student Lab Sheet

PHYSICAL FEATURES OF THE MARINE ENVIRONMENT

- Objectives and Procedures
- Teacher Background
- Teacher Presentation
- Transparencies: OCEANOGRAPHIC TOPOGRAPHY
  PHYSICAL FEATURES OF THE MARINE ENVIRONMENT
- Student Work Sheet
- Model: BATHYMETRIC FEATURES MODEL
- Film strip: PHYSICAL ENVIRONMENTS

OCEANOGRAPHIC INSTRUMENTS LAB [AT N.K.M.E.C]

Objectives and Procedures
Student Lab Sheets (Station #1 - #5)
Film: CHALLENGE OF THE OCEAN

BEACH ENVIRONMENTAL CONDITIONS

Objectives and Procedures
Teacher Background
Teacher Presentation
Transparencies: BEACH ENVIRONMENTAL CONDITIONS
CROSS-SECTION OF TYPICAL PUGET SOUND BEACH
Student Work Sheet

BIOLOGICAL ENVIRONMENT

Objectives and Procedures - Biological Environment
Film strip: BIOLOGICAL ENVIRONMENT
Objectives and Procedures - Written Marine Animal Reports
Student Work Sheet
Animal Cards
Objectives and Procedures - The Marine Aquarium
Student Work Sheets
Film: MYSTERIES OF THE DEEP
Classroom Aquarium

MARINE ANIMAL INVESTIGATION LAB [AT N.K.M.C.]

Objectives and Procedures
Film: STARFISH'S REALM
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PLANKTON

Objectives and Procedures
Student Lab Sheets
Davy Jones' Locker (Multi-media Study Center)

EVALUATION

Pre-Test
Post-Test
Program Evaluation

APPENDIX

Salt Water Aquariums
Beach Field Trip Guidelines

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

THE MARINE ENVIRONMENT

COLOR KEY

The pages of this unit have the following color scheme:

Blue.....Reference Material
Green.....Teacher Background
Yellow.....Performance Objectives and Procedures
Unit Goals and Instructional Objectives
Goldenrod..Teacher Presentation Materials
White.....Student Worksheets
Pink.....In Lab Activity Sheets

MULTI-MEDIA COMPONENTS

Films:

Environmental Awareness
*Challenge of the Ocean
Mysteries of the Deep
*Starfish's Realm

Film Strips:

Physical Environments
Biological Environments

Models:

Bathymetric Features Model
*World Features Model

Transparencies:

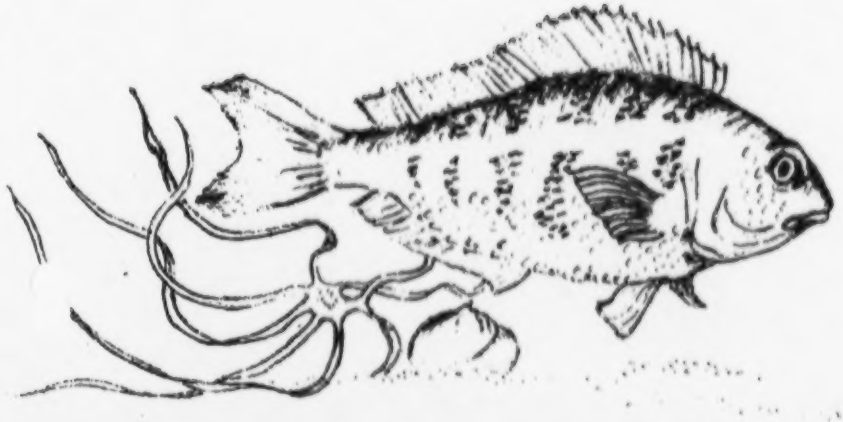
Characteristics of Sea Water
Oceanographic Topography
Physical Features of the Marine Environment
Beach Environmental Conditions
Cross-Section of Typical Puget Sound Beach

Classroom Marine Aquarium

*Multi-media Study Center

*To be used at the North Kitsap Marine Environmental Center.

MARINE ANIMAL INVESTIGATION LAB



NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB
AT
MARINE ENVIRONMENTAL CENTER

OBJECTIVES

Having completed the Marine Animal Investigation Lab, and with the aid of the color coded animal clue cards, students will meet the following objectives:

1. Students will be able to point out descriptive features of selected marine animals.

2. Students will be able to make inferences about marine animal behavior.

3. Students will be able to identify and write the names of at least 10 marine animals.

4. Working in groups of six and using the color coded animal clue cards, students will be able to identify at least 3 marine animals.

5. Using a binocular microscope and the Mini Lab Sheet, students will be able to distinguish basic features of at least 6 minute marine animals.

PROCEDURE

1. Lab orientation will be given by Marine Environmental Center staff.

2. Students are to perform activities as described in the Marine Animal Investigation Lab while at the Marine Environmental Center.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB
AT
MARINE ENVIRONMENTAL CENTER

STATION #1

MATERIALS: I.D. Lab Sheet

PROCEDURE: Students Choice. Student is to choose any animal in the lab and complete I.D. Lab Sheet for that animal.

STATION #2

MATERIALS: Student Contest Sheet; Book "Sound and the Sea"

PROCEDURE: Contest. Each group is to list the names of as many animals as possible at this station. All animals listed must be in the aquarium at this station. Animal names will be checked against a master list.

STATION #3

MATERIALS: Clue Cards and Color Coded Answer Sheet

PROCEDURE: Using your clues, locate and answer the questions concerning the specific animal. Find the particular kind of animal described by the clues.

STATION #4

MATERIALS: Microscope
Culture dish
Student Mini-Animal Lab Sheet

PROCEDURE: Complete Lab Sheet for six (6) mini-animals.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB AT N.K.M.E.C.
STATION #1

Picture of Animal

1. Name of animal: _____

_____

2. Color of animal: _____
3. Describe shape of animal: _____

_____

4. Describe how animal moves: _____

_____

5. Number and description of appendages _____
(arms or legs): _____
6. Describe how the animal could move if it is not moving: _____

_____

7. Why is there a need for this animal to be able to move: _____

_____

8. Approximate size of this animal in centimeters: _____

_____

9. What do you think this animal eats: _____

_____

10. Describe how you think this animal eats: _____

_____

11. Name of predator (enemy): _____
12. How does this animal protect itself: _____

_____

_____

13. What interesting characteristics or habits does this animal have:

_____

_____

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB AT N.K.M.E.C.

STATION #2 - CONTEST SHEET

NO.	ANIMAL NAME	NO.	ANIMAL NAME
1.	_____	21.	_____
2.	_____	22.	_____
3.	_____	23.	_____
4.	_____	24.	_____
5.	_____	25.	_____
6.	_____	26	_____
7.	_____	27.	_____
8.	_____	28.	_____
9.	_____	29.	_____
10.	_____	30.	_____
11.	_____	31.	_____
12.	_____	32.	_____
13.	_____	33.	_____
14.	_____	34.	_____
15.	_____	35.	_____
16.	_____	36.	_____
17.	_____	37.	_____
18.	_____	38.	_____
19.	_____	39.	_____
20.	_____	40.	_____

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB AT N.K.M.E.C.

STATION #3 - COLOR CODED CLUE CARDS

#1 CLUE: My protection is being like a rock.	#1 QUESTION: Do I have eyes to see where I'm going?
#2 CLUE: My foot is as big as I.	#2 QUESTION: Where do I hide my gills?
#3 CLUE: I use my tongue to eat but I never lick my plates	#3 QUESTION: What is my skin like?
#4 CLUE: I sometimes curl up in a ball.	#4 QUESTION: How many plates do I have?
#5 CLUE: Unless you sneak up on me you'll never pick me up.	#5 QUESTION: What do I eat?
#6 CLUE: My mouth is at the end of my foot.	#6 QUESTION: How do you spell my name?

CARDS

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB AT N.K.M.E.C.

STATION #3 - STUDENT COLOR CODED ANSWER SHEET

GREEN CLUE CARDS

1.

2.

3.

4.

5.

6.

BROWN CLUE CARDS

1.

2.

3.

4.

5.

6.

BLUE CLUE CARDS

1.

2.

3.

4.

5.

6.

ORANGE CLUE CARDS

1.

2.

3.

4.

5.

6.

YELLOW CLUE CARDS

1.

2.

3.

4.

5.

6.

PURPLE CLUE CARDS

1.

2.

3.

4.

5.

6.

PROCEDURE: Use all six (6) clue cards having the same color to answer the questions which appear on the reverse side of the cards. Write the answer to each question in the spaces provided above. Example: Blue Clue Card #1

Clue: My protection is being like a rock.

Question:

Do I have eyes to see where I'm going.

Write the answer to this question under Blue Clue #1.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

OCEANOGRAPHY UNIT NO. 6

MARINE ANIMAL INVESTIGATION LAB AT N.K.M.E.C.

STATION #4 - MINI LAB SHEET

I. A. Draw animal as seen under microscope.

B. Animal name_____

C. Most interesting feature_____

II. A. Draw animal as seen under microscope.

B. Animal name_____

C. Most interesting feature_____

III. A. Draw animal as seen under microscope.

B. Animal name_____

C. Most interesting feature_____

IV. A. Draw animal as seen under microscope.

B. Animal name_____

C. Most interesting feature_____

V. A. Draw animal as seen under microscope.

B. Animal name_____

C. Most interesting feature_____

VI. A. Draw animal as seen under microscope.

B. Animal name_____

C. Most interesting feature_____

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

INTRODUCTION

In the development of the First and Second Grade Marine Science Activities our goal has been to provide teachers and students experiences in discovering their surrounding marine environment.

The unit is uniquely designed to allow for individual teaching differences. The teacher may select from the Program Chart the type of instructional package he or she feels would be appropriate for their particular students. Even though two different teachers may select two different approaches via the Program Chart the students of both teachers will be taught the same basic concepts and behavioral outcomes will be very similar.

The unit also incorporates a variety of laboratory experiences using live animals at the Marine Environmental Center. In addition the teacher is given opportunities for inservice assistance with the unit and the many resources available through the Marine Environmental Center staff.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

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Language Arts

Overhead Projector

Related Activities

Resources

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

INSTRUCTIONAL OBJECTIVES

The instructional objectives are to provide activities and experiences for the students which will enable them to recognize and understand the following concepts:

1. Body structures of marine animals allow them to move in various ways.
2. Body structures of marine animals allow them to gather food in various ways.
3. Body structures of marine animals allow them to protect themselves in various ways.
4. Ecology of an area can be disrupted by outside influence.
5. Marine animals are interdependent on each other for food supply.
6. Marine animals are interdependent on each other for protection.
7. Marine life is interdependent on each other to maintain the natural ecology of an area.
8. Marine animals have adapted to their environments.
9. Marine animals change in physical appearance as they grow.
10. Various types of beach zones support various types of life.
11. Man can seek recreation and food from marine life.
12. Man will be able to enjoy the marine environment for many years to come with wise use of the marine life.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

DEVELOPING UNIT OF STUDY

PROCEDURE:

1. Choose from the Program Chart the instructional objective or objectives you wish the class to develop as a result of your unit of study.

2. Use the first column of code numbers from the Program Chart to determine the behavioral objectives that apply to the instructional objective selected. The behavioral objectives are listed in the section following the Program Chart.

3. Use the following columns from the Program Chart to direct you to activities which bring about the desired behavioral changes. There is an appropriate section for each of these columns following the section on objectives.

NOTE: There are additional sections with Math activities and A-V resources that may be incorporated into the unit activities.

This plan should not be considered a complete course of study unto itself. These materials are meant to be used in conjunction with your own knowledge and teaching methods and abilities. Use your own ideas as well.

STUDENT EVALUATION:

Student evaluations may be desired during the course of the unit. For this unit and grade level an evaluation would consist of a definition picture, where the student would be required to draw the animal, label or identify, name and tell something about the animal.

When the teacher observes the student performing the terminal behavior as outlined in the behavioral objectives, the student has then accomplished the objective.

LAB EXPERIENCE:

This unit is designed to be taught in the classroom with essential learning experiences being conducted at the North Kitsap Marine Environmental Center. Scheduling with the Center should be made as far in advance as possible. Contact the Center for further information or assistance in developing your unit.

SALT WATER AQUARIUMS:

When possible, a salt water aquarium and its maintenance will be provided on a loan basis while the marine science program is being conducted in your building.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

PROGRAM CHART

INSTRUCTIONAL OBJECTIVE NO. 1

To provide activities and experiences for the students which will enable them to recognize and understand that body structures of marine animals allow them to move in various ways.

Behavioral Objective	Worksheet	Art Activity	Creative Dramatics & Poetry	Overhead
20	W4,W5	A5,A7	P3,CD3	OH1,OH9
21	W4	A1,A5-7		OH8
22	W5,W6		P3,CD3	OH1,OH3,OH9
23	W3,W5,W7,W8 W9	A5,A6,A7 A9	P3,P4	OH4,OH7,OH9 OH10,OH11,OH13
24	W2,W3,W7	A1		OH7,OH9,OH13
25	W4	A1		OH2,OH8
26		A2,A5-7		
27	W8		CD5	OH2

INSTRUCTIONAL OBJECTIVE NO. 2

To provide activities and experiences for the students which will enable them to recognize and understand that body structures of marine animals allow them to gather food in various ways.

Behavioral Objective	Worksheet	Art Activity	Creative Dramatics & Poetry	Overhead
10	W7	A1,A10-13	P4	OH9,OH10,OH11
20	W4,W5	A5-7,A9	P3,CD3,CD1	OH1,OH9,OH13
21	W4	A1,A9,A12		OH2,OH8
27	W8,W11	A3	CD5	OH2,OH7
28	W8	A10-13	CD2	OH2,OH6,OH7

15. A child can verbally explain how to secure at least two of the above mentioned animals.

16. A child can act out what conservation steps he should take immediately after digging for clams.

17. A child will not destroy marine life when he is at the beach.

18. A child can give one reason why he should not remove specimens from a beach.

19. A child can verbally give one reason explaining why the Department of Fish and Game have placed limits on edible marine life.

20. A child can label the parts of a crab.

21. A child can label parts of a starfish.

22. A child can list which animals move by legs.

23. A child can list which animals have shells.

24. A child can list two species of marine life which are attached to a stationary object.

25. A child can list one animal that has tube feet.

26. A child can list two kinds of fish that have fins.

27. A child can describe the structure of a bivalve that allows it to dig.

28. A child can list at least two animals that secure their food by siphons.

29. A child can list three marine animals that eat microscopic life.

30. A child can verbally name one marine animal that obtains its food by means of waving tentacles.

31. A child can name animals that have a hard covering that protects them (i.e., all shell fish, starfish).

32. From a variety of marine pictures the child can point to the animals that contract to protect themselves.

33. The child can write the names of the marine animals that protect themselves through speed of movement.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

WORKSHEETS

The child is not expected to read these worksheets independently. The teacher should read the worksheets orally to the class. If the reading level of your class allows them to do the worksheets independently let them do it; if not give them assistance.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

CLAMS AND OYSTERS

Beginning concepts dealing with classification and interrelationships should be developed during this section. The students should be able to begin noticing structural differences such as univalves verse bivavlves. Their own system of classification may be developed by their observations of likenesses and differences.

Animal locomotion as it relates to the interrelationships between one animal and another (example - starfish and clam) may be developed with the students during their P.E. period where they can simulate the various movements.

Aquarium observations may reveal a clam, if placed on loose sand or fine gravel, burrow into the bottom. Students may wish to discuss and speculate on how an oyster can make a pearl from a grain of sand and why only certain kinds of oysters are pearl oysters.

It is quite likely that over a period of time a clam or oyster will be eaten by a starfish. If so, the students should try to observe how the starfish is able to open the shell of the clam or oyster by wearing him out to exhaustion. The questions on page 4 may be used as a student evaluation of the level of concept development attained.

Name _____

Clams and Oysters

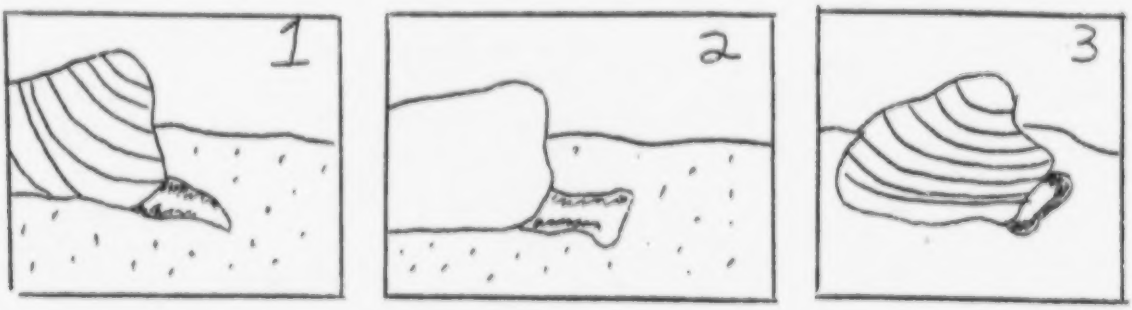
Clams and oysters are sea animals that are covered by 2 shells. They can be called bivalves. Bivalves means "two-shelled".

Oysters live on top of the sand. Oysters like to live on something. They like to live close together. They sometimes live piled up on each other. Some times oysters live on a log or rock.

Name _____

Clams and Oysters

Clams live under the sand. Clams crawl by using their foot to move. They can use this foot to go under mud.

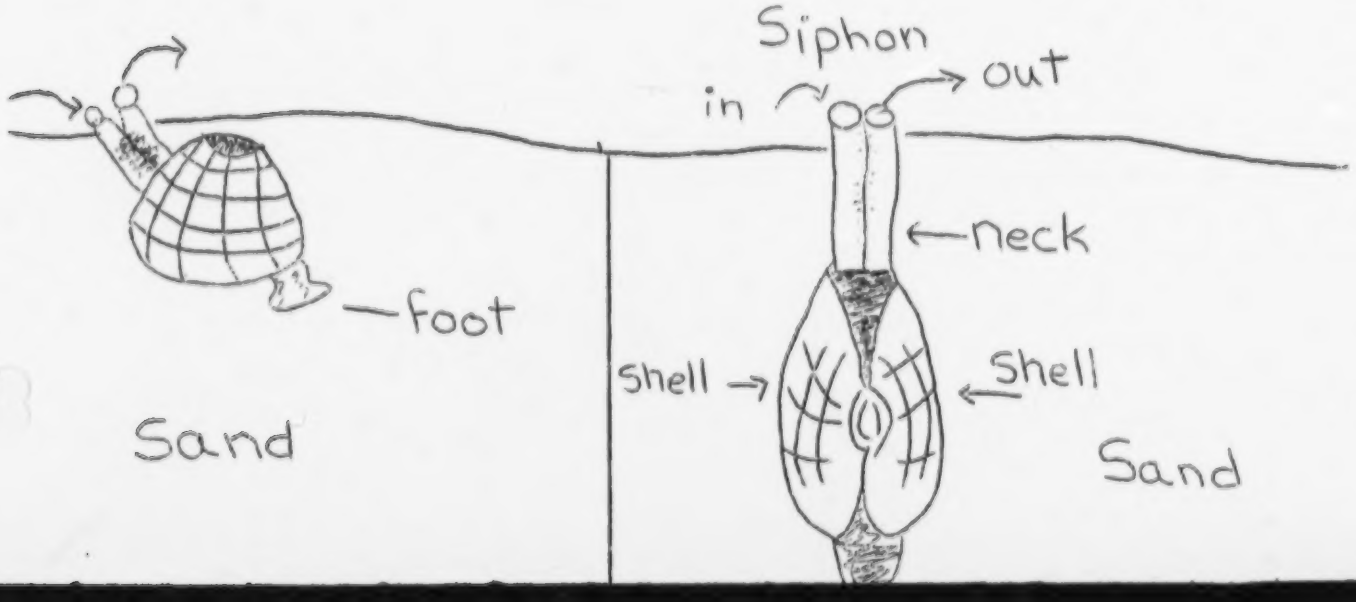


The bivalves enemies are the starfish, the oyster drill, the moon snail and people.

Name _____

Clams and Oysters

Clams and oysters are bivalves. These bivalves eat little animals and plants that live in the water. You can not see these animals. They suck the water into their body, eat the food, and spit the water out. Look



Name _____

Clams and Oysters

Answer these questions.

1. How many shells do oysters have? _____
2. Where do clams live? _____
3. What do clams and oysters eat? _____
4. What helps a clam go under the mud? _____
5. Who likes to eat bivalves?
   1. _____
   2. _____
   3. _____

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

FRENCH MURAL

1. Use direct method or opague projector method to produce mural consisting of line drawings. Use felt tip pens to produce stronge outstanding lines. Keep drawings simple avoid fine details.

2. Cut mural into pieces so that there is one per child. Be sure to number back and make a record of how they were numbered.

3. Child colors or paints his piece. He is not to be concerned about subject matter. (Some teachers find it best to limit colors to four).

4. Put back in order and paste onto butcher paper or tape pieces together.

ADDITIONAL ART ACTIVITIES

1. Collage using beach materials.

2. Sculptures from shells and driftwood.

3. Painting using brushes, gadgets, sponges.

4. See Marine Science Lab for instructions for making:

   Plankton nets
   Fish prints
   Mounting kelp

5. Draw a picture of future cities under the sea.

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

FIRST AND SECOND GRADE MARINE SCIENCE ACTIVITIES

OVERHEADS

In addition to using the overhead transparencies provided; the following are suggested uses of the overhead projector with this unit:

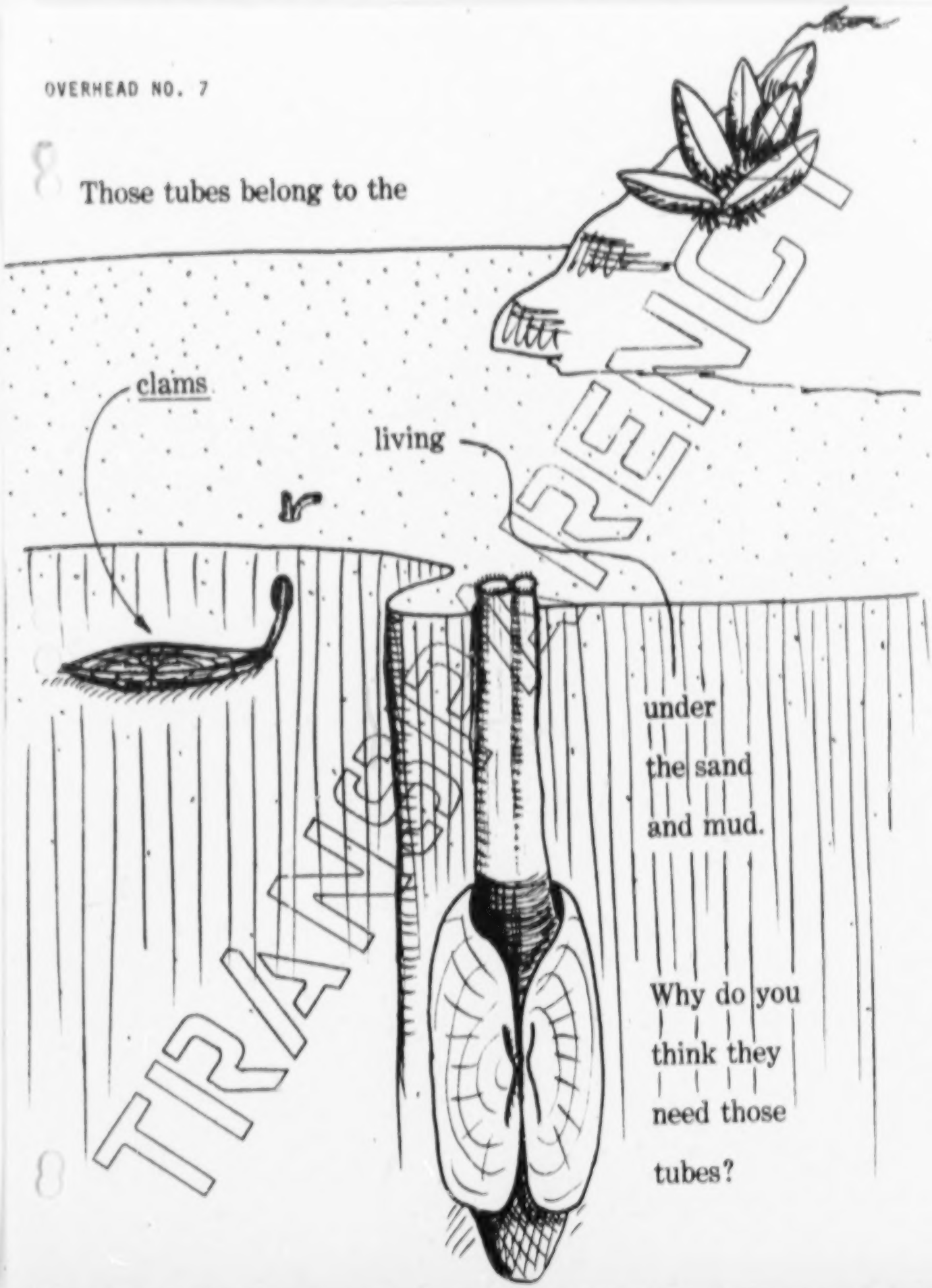
1. Place animals directly on overhead and let them move across it. (Crabs are great.)
2. Place glass jar containing animal on overhead -- observe tube feet, tenacles, etc.
3. Place layer of sand on overhead, let crabs walk across, examine tracks.
4. Use overhead to compare sizes (silhouette).
5. Use with glass container to observe wave motions.
6. Use to show water movements made by animals by adding small amounts of food coloring to jar of water containing filter feeders.

CAUTION: Prolonged exposure to the intense heat may be fatal to the animals.

NOTE: See transparencies for No. OH7-OH14.

OVERHEAD NO. 7

Those tubes belong to the



TRANSPARENCY

Resource Directory

North Kitsap Marine Environmental Center

NORTH KITSAP SCHOOL DISTRICT 400

ROUTE 1, BOX 631

POULSBO, WASHINGTON 98370

779-5140

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

WHAT IS THE HISTORY OF THE BUILDING?

The building in which the center is located was built in 1911, and served as a warehouse for bringing cod fish which was brought in on large sailing vessels. It is now owned by the Keypoint Oyster Company and is leased to the school district. Federal funds were obtained to remodel the building and to equip it.

WHAT IS THE MARINE ENVIRONMENTAL CENTER?

This facility is part of the public school system of the North Kitsap School District. The facility was planned, built and staffed with funds from the Washington State Office of Education. North Kitsap School District and the other school districts in the county also contributed money and services.

WHAT IS THE PURPOSE OF THIS CENTER?

The Center's purpose is to stimulate interest in the study of our environment. The Center works with all grades of public school children and with the community. The Center promotes and supports more effective use of Puget Sound's natural and human resources. Programs and materials in marine science are devleoped and distributed by the Center.

WHAT FACILITIES DOES THE CENTER HAVE?

---20 trays and tanks for live marine animals with continuous running sea water

---laboratory work tables for 32 students

---30 student dissecting microscopes and 4 compound microscopes

---a resource room containing a marine science library, exhibits, maps and charts, audio visual equipment and films

---oceanographic research equipment

---dark room and photographic equipment

---ten portable 40 gallon refrigerated aquariums for use in classrooms

---small boats for teaching navigation, boat handling, and student research projects

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

WHAT SERVICES DOES THE CENTER PROVIDE?

---trained teachers to assist in teaching classes at the Center and in the classroom

---assistance in planning and scheduling field trips

---curriculum materials and assistance in developing and compiling new curriculum

WHO MAKES USE OF THIS CENTER?

Students come to the Center from throughout Kitsap County for lab experiences and programs. North Kitsap students meet daily at the Center.

Anyone may visit the Center. It is open to visitors from 9:00 a.m. to 5:00 p.m. on weekdays. Classes and groups should call 779-5140 and make an appointment. Programs can be provided for preschool through adult levels.

WHERE IS THE CENTER LOCATED?

The Center is located on Third Avenue at the southern edge of Poulsbo on Liberty Bay.

WHO ARE THE STAFF MEMBERS?

Andrew L. Driscoll, M. S.
Director

C. David Borden, M. A.
North Kitsap Coordinator

Kjell Schroder, B. A.
County Coordinator

Henry Leon, B. A.
Laboratory Assistant

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

AUDIO VISUAL RESOURCES

AVAILABLE FOR USE AT THE MARINE ENVIRONMENTAL CENTER

FILMS:

Exploring The Ocean

The Marine Biologist

Marine Ecology

Science of the Sea

Tides of the Ocean

What's Under the Ocean

Challenge of the Oceans

Conquering the Sea

The Deep Frontier

Environmental Awareness

The Starfish's Realm

FILM LOOPS:

Collecting Plankton

Plankton: Diversity

Plankton: Food Webs & Feeding Relationships

Plankton: Mobility

Plankton: The Larval Form

Plankton: Adult Forms

How Animals Move Under Water, Marine Species - Parts I & II

Marine Predators, Competition For Food

NORTH KITSAP MARINE ENVIRONMENTAL CENTER
E.S.E.A. TITLE III

RESOURCE PEOPLE

BOATING

Safety.....Allan, Rosemary
11330 Hiway 3
Bremerton, Washington

Notes: Water Safety Instructor
Will Teach Any/All Grades

Engineering.....Diehl, Paul
355 Grow Avenue Northwest
Winslow, Washington

Notes: Will speak on Naval Architecture, Marine Engineering, Webb Institute of Naval Arch. Prefers high school age.

.....Glosten, L. R.
Route 6, Box 6302
Crystal Springs
Bainbridge Island, Washington

Notes: Will speak on Ship Design, Shipbuilding and Ocean Engineering to intermediate or high school.

Piloting.....Henshaw, Captain James F.
Route 5, Box 5089
Bainbridge Island, Washington

Notes: Will speak on Shipping, Piloting and ferries...

Building.....Monk, Robert E. (Mr. and Mrs.)
Route 5, Box 5085
Bainbridge Island, Washington

Notes: Will speak on Shipbuilding, Small Boats and Woodworking.

Navigation.....Kinney, Ted
Route 1
Poulsbo, Washington

Notes: Power squadron.